EAST END COLONY

PUBLIC WATER SYSTEM

PWS ID No. MT0001780

DRAFT SOURCE WATER DELINEATION & ASSESSMENT REPORT

PREPARED BY:

MONTANA RURAL WATER SYSTEMS, INC.
for THE MONTANA SOURCE WATER PROTECTION PROGRAM

PREPARED FOR:

East End Colony
Joe Waldner
Certified Operator

PO Box 297
Havre, Montana, 59501

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Montana Department of Environmental Quality

Source Water Protection

EXECUTIVE SUMMARY

This Source Water Delineation and Assessment Report (SWDAR) was prepared under the requirements and guidance of the Federal Safe Drinking Water Act and the US Environmental Protection Agency, as well as a detailed Source Water Assessment Plan developed by a statewide citizen's advisory committee here in Montana. The Department of Environmental Quality (DEQ) is completing these assessments for all public water systems in Montana. The purpose is to provide information so that the public water system staff/operator, consumers, and community citizens can begin developing strategies to protect their source of drinking water. The information provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the inventory region, an inventory of potential sources of contamination within this area, and an assessment of the relative threat that these potential sources pose to the water system.

East End Colony's drinking water is supplied by one well (Well 2). In accordance with the Montana Source Water Protection Program criteria (1999), the aquifer (source water) is considered to have a **high sensitivity** to potential contaminant sources, since the well is completed in shallow unconfined alluvium. Sensitivity is defined as the relative ease that contaminants can migrate to source water through the natural materials.

As part of this assessment, three types of source water protection management areas were mapped for the East End Colony public water system. They are: the control zone, the inventory region, and the recharge region. Potential sources of contamination were identified within each of these three regions and the results are as follows:

- No potential sources of contamination were identified within the control zone. The goal of management in the control zone is to avoid introducing contaminants directly into the water supply's well or immediate surrounding areas. The control zone is delineated as a 112-foot radius around the wellhead. The radius is based upon a 100-foot control zone plus allowance for two 12-foot lateral collectors. All sources of potential contaminants should be excluded from the control zones. Additionally, the PWS should ensure that local runoff is directed away from the wellheads.
- Significant potential contaminant sources identified within the inventory region are limited to agricultural land.

  The inventory region should be managed to prevent contaminants from reaching the well before natural processes reduce their concentrations. The inventory region includes the area upgradient of the well that is expected to supply groundwater recharge to the well over the next three years.
- Potential contaminant sources identified within the recharge region are limited to agricultural lands. Few point sources of potential contaminants were identified in this sparsely developed region.

  The goal of management in the recharge region is to maintain and improve water quality over long periods of time or increased usage. Recharge to the aquifer is primarily from infiltration of precipitation and surface water in the Milk River watershed upgradient of East End Colony.

Low risk potential sources and potential sources located outside the inventory region, but within the recharge region may still pose a threat over time, but are not discussed in detail in this assessment. This provides a quick look at the existing potential sources of contamination that could, if improperly managed or released, impact the source water for the East End Colony. The susceptibility analysis provides the community and the public water system with information on where the greatest risk occurs and where to focus resources for protection of this valuable drinking water resource.

The costs associated with contaminated drinking water are high, and prevention is preferable to treatment. Public awareness is a powerful tool for protecting drinking water. The information in this report will help increase public awareness about the relationship between land use activities and drinking water quality.

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1.0 INTRODUCTION

Bill O'Connell of Montana Rural Water Systems, Inc. (MRWS) completed this Source Water Delineation and Assessment Report (SWDAR). Eric Sivers, a hydrogeologist with the Montana Department of Environmental Quality (DEQ) Source Water Protection Section, provided review and assistance. Additional information on the colony public water supply was provided by a sanitary survey completed by the Cadmus Group, Inc. in January 2003. This report is attached as Appendix A.

The primary purpose of this source water delineation and assessment report is to provide information that helps East End Colony protect its drinking water source. The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies from contamination. The major components of the Montana Source Water Protection Program are *delineation* and *assessment*. Delineation is the process of mapping source water protection areas, which contribute water used for drinking. Assessment involves identifying areas where contaminants may be generated, stored, or transported, and then determining the relative potential for contamination of drinking water by these sources.

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for the completion of the delineation and assessment for the East End Colony Public Water System (PWS) as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182).

2.0 BACKGROUND

East End Colony is located in Hill County in north-central Montana (Figure 1). The nearest major city is Havre, approximately 20 miles to the southwest. According to the Census Bureau, the population of Hill County in 2000 was 16,673. The East End Colony PWS serves a population of approximately 65 with 10 service connections. East End Colony is primarily an agricultural concern, and is located in a rural agricultural setting.

2.1 PHYSICAL SETTING

2.1.1 Geography and Geology

East End Colony is located on the glaciated plains of north-central Montana. East End Colony lies at an elevation of approximately 2,700 feet above mean sea level.

Bedrock beneath the East End Colony area is the Upper Cretaceous Bearpaw Shale. The Bearpaw Shale consists of dark-gray to black fissile shale that weathers to light-gray or brownish-gray. Thin beds of brownish fine-to-medium grained sandstone are present, as are numerous bentonite beds (Lopez, 2002; Condon, 2000). Pleistocene glaciation covered the area with an extensive blanket of till, a heterogeneous mixture of silt, sand, and gravel. According to the one well log available for the colony, the till is approximately 35 feet thick in the area.

The supply well is completed in the glacial deposits. The aquifer is unconfined. Recharge occurs locally via infiltration of precipitation in the vicinity of the well. The geology of the East End Colony area is shown on Figure 2.

East End Colony is located in the Western Glaciated Plains groundwater region of North America. This province is characterized by hills and relatively undissected plains underlain

by glacial deposits over relatively flat-lying consolidated sedimentary rocks of Mesozoic and Cenozoic age (Heath, 1984). The community is in the Middle Milk River watershed (10050004), in the Lower Missouri River drainage of Montana.

2.1.2 Climate

Climate in the East End Colony area is semi-arid and typical of north-central Montana. Annual total precipitation is 12.73 inches. Rainfall occurs May through September with May and June being the wettest months. East End Colony receives an annual average of 43 inches of snow, mainly October to April. Information on the colony climate is taken from the Havre City climate station. Data is provided by the Western Regional Climate Center, operated by the Desert Research Institute of Reno, Nevada. See Table 1 for additional climate information.

Table 1. Monthly Climate Summary: Havre City Climate Station (243994)

Period of Record: 1/ 1/1893 to 1/31/1961

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Ave. Max. Temp (F)	25.5	27.5	39.0	56.7	67.3	74.5	84.4	82.0	70.3	58.8	41.2	31.0	54.9
Ave. Min. Temp. (F)	5.3	6.5	17.4	31.8	42.0	50.0	55.5	52.6	42.7	33.0	19.9	11.3	30.7
Ave Tot. Precip. (in.)	0.61	0.45	0.55	0.95	1.80	2.75	1.48	1.09	1.19	0.74	0.56	0.54	12.73
Ave. Tot. Snowfall (in.)	8.3	7.3	4.7	5.9	0.5	0.2	0.0	0.0	0.4	2.8	7.0	6.1	43.3
Ave Snow Depth (in.)	3	3	2	1	0	0	0	0	0	0	2	2	1

2.2 THE PUBLIC WATER SUPPLY

2.2.1 Water Supply System

The East End Colony PWS serves approximately 65 people. The PWS is classified as a community public water system since it serves at least 25 of the same people every day. Information on the water system was obtained from the report completed by MRWS and the most recent sanitary survey, completed by the Cadmus Group in 2003 (attached as Appendix A). One well (Well 2) provides drinking water to East End Colony. Due to high nitrate and mineral content in the source water, the colony uses reverse osmosis (RO) and ion-exchange nitrate removal treatment systems. Due to the shallow groundwater source, the water is also subjected to carbon filtration and UV disinfection.

2.2.2 Supply Well Information

East End Colony's drinking water is supplied by one well (Well 2), approximately four miles south-southwest of the colony. This is a dug well, four feet in diameter, completed to approximately 15 feet below grade. The well includes two 12-foot lateral collectors that extend from the bottom of the well. No logs are available for this well.

2.2.3 Source Water

The colony's drinking water is supplied by a shallow unconfined aquifer in glacial deposits overlying the Bearpaw Shale.

Recharge probably occurs via infiltration of surface water and precipitation upgradient of the well, north of Redrock Coulee. Groundwater flow is probably to the south and southeast, ultimately towards the Milk River.

The aquifer is classified as shallow unconsolidated alluvium. According to the criteria established by the Source Water Protection Program (DEQ, 1999), the source water aquifer is considered to have **high sensitivity** to potential contamination.

2.3 WATER QUALITY

The Safe Drinking Water Act requires each PWS to perform regular sampling of their water supply to detect contamination. The analytical parameters include: coliform bacteria and other pathogenic organisms, nitrates, metals, petroleum hydrocarbons, and other organic chemicals. The monitoring schedule depends on factors such as the size and source water of a PWS, the number of supplies (e.g. wells), and the population served. Monitoring programs are tailored to each system, following the general protocols defined by DEQ. Monitoring schedules are available at: <http://nris.state.mt.us/wis/swap/swapquery.asp>. The East End Colony PWS monitoring data from DEQ's database for the past five years was reviewed and is summarized in this section. Analytical results are compared to quality standards established by the US EPA. Maximum Contaminant Levels (MCLs) are enforceable standards that limit the highest level of a contaminant allowed in drinking water. National Secondary Drinking Water Standards (known as SMCLs) are non-enforceable guidelines regarding contaminants that may cause aesthetic (color, odor, taste) or cosmetic (staining, skin/tooth discoloration) issues.

2.3.1 Public Water Supply Monitoring Results

No health violations are reported for the period 2000 to 2005. A monitoring violation was recorded in 2002; the system is currently in compliance.

Bacteria were detected in October 2000, but have not been detected in subsequent sampling. Total N (Nitrate + nitrite) was occasionally reported at concentrations below the MCL. 2.62 mg/L was the highest reported concentration. Chloroform was detected once at a low concentration, and probably represented a chlorination byproduct. The water quality results are attached as Appendix B.

2.3.2 Background Water Quality Monitoring Results

Background water quality data was not identified for the East End Colony supply wells. Background water quality sampling would typically include general water quality parameters: major dissolved ions (calcium, magnesium, sodium, potassium, iron, manganese, silica, bicarbonate, carbonate, chloride, sulfate, nitrate, fluoride and orthophosphate), trace elements, and metals.

3.0 MANAGEMENT AREA DELINEATION

This report delineates three source water management areas. The goal of source water management is protection of the source water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the inventory region, and 3) ensuring that major land use activities or other significant activities in the recharge region pose minimal threat to the source water.

3.1 CONCEPTUAL MODEL

East End Colony is located in the Middle Milk watershed (10050004), in the Lower Missouri River drainage of Montana. As described above, the majority of East End Colony's drinking water source is interpreted to originate as regional rainfall and surface water in the Milk River watershed upgradient of the colony.

The public water supply is considered to have high sensitivity to contamination, as the wells are completed in shallow unconsolidated sediments. This determination is according to the DEQ Source Water Protection Program criteria for ranking aquifer sensitivity (DEQ 1999).

3.2 DELINEATION

Methods and criteria for delineating source water protection areas are specified in the Montana Source Water Protection Program (DEQ, 1999). The delineated management zones for the wells are shown on Figure 3.

Control Zone – A 112-foot radius control zone is delineated for the well. This allows for a 100-foot exclusion zone extending outward from the 12-foot lateral collectors. All sources of potential contaminants should be excluded in this region.

Inventory Region – The inventory region is the area that is expected to contribute to the water supply within no less than three years. According to the DEQ's Source Water Protection Program criteria for an unconfined shallow alluvium aquifer (DEQ, 1999), the inventory zone for the wellhead was delineated based on a three-year time of travel estimate. Using the uniform flow equation (EPA, 1991), this three-year capture zone is estimated to extend approximately 2,500 feet from Well 2. This estimate is somewhat speculative, as it is based on published values for geologic materials. Field studies of the materials actually found at the site would be preferable, but are beyond the scope of this report. Due to the high sensitivity of the well, an area of one-mile radius was used as the inventory region. All signification sources of potential contaminants will be inventoried in this region.

Recharge Region – The recharge region for the East End Colony source water extends north of the hill, upgradient from Redrock Coulee. The inventory for the recharge region focuses on general land uses and large industrial facilities. The goal of management in the recharge region is to maintain and improve the long-term quality of groundwater in the aquifer.

4.0 INVENTORY

Significant potential contaminant sources in the source water management areas were inventoried to assess the susceptibility of East End Colony's source water to contamination, and to provide a foundation for source water protection planning. The inventory for East End Colony focuses on facilities or features that generate, use, store, or transport potential contaminants, as well as certain land uses in the inventory and recharge regions. It is important to remember that the sites and areas identified in this section are only potential sources of contamination to the drinking water. Contamination of drinking water sources is less likely when potential contaminants are properly used and managed.

4.1 INVENTORY METHOD

The inventory focus is slightly different in each of the delineated management areas. The inventory for the East End Colony focuses on all activities in the control zones; certain types of facilities and land uses in the inventory region and surface water buffer; and general land uses and large facilities

in the Recharge Region. Information on facilities and land uses that are potential sources of regulated contaminants was obtained from a number of databases, described below. The process for completing the inventory included several steps, which are summarized as follows:

- Step 1: Land uses were identified from the U.S. Geological Survey's (USGS) Geographic Information Retrieval and Analysis System <http://nris.state.mt.us/gis/datalist.html>. Sewered and unsewered residential land uses were identified from boundaries of sewer coverage obtained from municipal wastewater utilities.
- Step 2: The US Environmental Protection Agency's (EPA) Envirofacts System <http://www.epa.gov/enviro/> was queried to identify EPA-regulated facilities located in the management areas. This system accesses facilities listed in the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory System (TRIS), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) and the Permit Compliance System (PCS - for Concentrated Animal Feeding Operations with MPDES permits). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility should be classified as a significant potential contaminant source.
- Step 3: Montana DEQ databases were queried to identify any of the following in the management areas:
  - Underground storage tanks (USTs) <http://www.deq.state.mt.us/UST/USTDownloads.asp>
  - Hazardous waste contaminated sites, above ground storage tanks (ASTs), landfills, and abandoned and active mines, including gravel pits <http://nris.state.mt.us/gis/bundler/>

  Any information on past releases and present compliance status was noted.
- Step 4: Major road and rail transportation routes were identified throughout the inventory region: <http://nris.state.mt.us/gis/gisdatalib/gisDataList.aspx>.

Potential contaminant sources are considered significant if they fall into one or more of the following categories:

1. Large quantity hazardous waste generators.
2. Landfills.
3. Underground storage tanks.
4. Known groundwater contamination (including open or closed hazardous waste sites, state or federal Superfund sites, and leaking UST sites).
5. Underground injection well.
6. Major roads or rail transportation routes.
7. Cultivated cropland exceeding 20% of the inventory region.
8. Animal feeding operations.
9. Wastewater treatment facilities, sludge handling sites, or land application areas.
10. Septic systems.
11. Sewer mains.
12. Storm sewer outflows.
13. Abandoned or active mines

4.2 INVENTORY RESULTS

4.2.1 Control Zone Inventory Results

No potential sources of contamination were identified within the control zone. The PWS should ensure that potential sources of contamination are excluded from the control zone and that positive drainage away from the wellhead is maintained.

4.2.2 Inventory Region

The inventory region includes agricultural land. No point sources of potential contaminants were identified within this region.

The inventory results for East End Colony's source water are summarized in Table 2, and are shown on Figure 3.

The land cover identified within the inventory region is limited to agricultural land. Septic system density within the inventory region is low. More than half of the inventory region is sewered.

4.2.3 Recharge Region Inventory Results

According to the 1992 National Land Cover dataset, the primary land cover in the recharge region is grass rangeland and crop/pasture. Septic system density within the recharge region is low. The septic system density does not present a hazard to the PWS drinking water.

4.3 INVENTORY UPDATE

To make this SWDAR a useful document for the years to come, the certified water system operator should review the inventory every year. Changes in land uses or potential contaminant sources should be noted and additions made as appropriate. The complete inventory should be submitted to DEQ every five years to ensure the source water delineation and assessment remains current.

5.0 SUSCEPTIBILITY ASSESSMENT

5.1 INTRODUCTION TO SUSCEPTIBILITY

Susceptibility is the degree of likelihood for a public water supply to be impacted by inventoried contaminant sources, at concentrations that would pose a concern. Susceptibility is assessed to

prioritize potential pollutant sources for local management, in this case the East End Colony PWS managers and operators.

5.2 DETERMINATION OF SUSCEPTIBILITY

According to the DEQ Source Water Protection Program (DEQ, 1999) Susceptibility is determined by considering the *hazard* rating for each potential contaminant source relative to any contaminant *barriers*. Proximity or density of significant potential contaminant sources and nature of contaminants determines hazard.

Barriers to contamination are anything that decreases the likelihood of contaminants reaching a spring or well. Barriers may be engineered structures, management actions, or natural conditions. Examples of engineered barriers include spill catchment structures and leak detection for underground storage tanks. Emergency planning and best management practices (BMPs) are considered management barriers. Thick clay-rich soils, a deep water table or a thick unsaturated zone above the well intake are examples of natural barriers. East End Colony is credited with one barrier: water treatment.

5.3 RESULTS OF SUSCEPTIBILITY ASSESSMENT

A summary of the susceptibility assessment for the East End Colony wells is provided in Table 2. This table only includes the potential contaminant sources (identified in the inventory) that were determined to present a significant potential risk to the drinking water supply. Therefore, this list is not exhaustive, and it is highly recommended that the PWS operator and community members familiar with the nature of businesses and land use in the area enhance the inventory through further research and local input.

Table 2. Susceptibility Assessment of Significant Potential Contaminant Sources

Potential Contaminant Source	Potential Contaminants	Hazard	Hazard	Barriers	Susceptibility	Management Recommendations
Inventory Region						
Agricultural Land: Cropland and grazing lands	NO_3 and SOCs from fertilizer, pesticides and herbicides. Pathogens and NO_3 from pastures.	Nitrate loading of source water, pathogens infiltrating into groundwater, chemicals leaching into groundwater	High	Water treatment	High	Encourage BMPs. Apply all chemicals according to label instructions. Limit application within inventory region. Limit crop-fallow dryland agriculture within inventory region.
Recharge Region						
Agricultural Crop Land	NO_3 and SOCs from fertilizer, pesticides and herbicides. Pathogens (if grazing occurs)	Contaminants leaching into groundwater	Not assessed	None	Not assessed outside inventory region	Encourage use of BMPs in the recharge region.

BMPs best management practices
NO_3 nitrate
SOCs synthetic organic compounds

6.0 LIMITATIONS

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for delineation and assessment of the East End Colony Public Water System (PWS) as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182). The following limitations should be noted:

- This report was prepared to assess the susceptibility of the East End Colony PWS to significant potential contaminant sources, and is based on published information and correspondence within DEQ files. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the East End Colony public water supply and not any other public or private water supply. Also, not every potential or existing source of groundwater contamination in the East End Colony area has been identified. Only potential sources of contamination in areas that contribute water to its drinking water source are considered
- Delineation of the source water protection areas for the East End Colony well is based on map and aerial photograph interpretation. In the absence of extensive field investigations to accurately characterize aquifer characteristics, the assumptions are necessarily conservative. The use of such conservative assumptions was to ensure that the inventory zone reflects the actual area where contamination to the system may occur.
- The potential contaminant sources described in the inventory are identified from readily available information. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. The use of multiple sources of information increases the likelihood that the major threats to the source water for East End Colony's public water supply have been identified. <u>The inventory is not exhaustive</u>. If a type of potential contaminant source is not identified in the inventory or susceptibility assessment of this report, it does not necessarily follow that the potential for contamination does not exist, or there is not a threat. It is highly recommended that the PWS and community enhance or refine the identification of potential contamination sources through further research and local input.

7.0 CONCLUSIONS

This Source Water Delineation and Assessment Report (SWDAR) was prepared under the requirements and guidance of the Federal Safe Drinking Water Act and the US Environmental Protection Agency, as well as a detailed Source Water Assessment Plan developed by a statewide citizen's advisory committee here in Montana. The Department of Environmental Quality (DEQ) is completing these assessments for all public water systems in Montana. The purpose is to provide information so that the public water system staff/operator, consumers, and community citizens can begin developing strategies to protect their source of drinking water. The information that is provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the inventory region, an inventory of potential sources of contamination within this area, and an assessment of the relative threat that these potential sources pose to the water system.

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The costs associated with contaminated drinking water are high, and prevention is preferable to treatment. Public awareness is a powerful tool for protecting drinking water. The information in this report will help increase public awareness about the relationship between land use activities and drinking water quality.

8.0 REFERENCES

Condon, Steven M., 2000. Stratigraphic Framework of Lower and Upper Cretaceous Rocks in Central and Eastern Montana. U.S. Geological Survey Digital Data Series DDS-57, 12 p.

Heath, Ralph C., 1984. Ground-water Regions of the United States. U.S. Geological Survey, Water Supply Paper 2242, Washington D.C., 78p.

Lopez, David A., 2002, Geologic map of the Chester 30' x 60' quadrangle, north-central Montana. Montana Bureau of Mines and Geology Open File Report 445, 4 page(s), scale 1:100,000.

Montana Bureau of Mines and Geology, 2005. Groundwater Information Center, lithologic well logs. http://mbmggwic.mtech.edu/

Montana Department of Environmental Quality Public Water Supply Section, 2005. Safe Drinking Water Information System (SDWIS). http://10.194.19.7/dev60cgi/rwcgi60.exe?SDWIS&report=bigreport.rep

Montana Department of Environmental Quality (DEQ), 1999. Montana Source Water Protection Program. http://www.deq.state.mt.us/ppa/p2/swp/index.asp

Montana Department of Environmental Quality Underground Storage Tank Program web site. http://www.deq.state.mt.us/Rem/tsb/iss/USTDownloads.asp

Montana Natural Resources Information Interactive Map website. 2005. http://nris.state.mt.us/interactive.html

Raines, G.L., and Johnson, B.R., 1995, Digital representation of the Montana state geologic map in ARC/INFO export format.: U.S. Geological Survey Open-File Report 95-0691.

United States Census Bureau, 2000. http://factfinder.census.gov/home/saff/main.html?_lang=en

United States Environmental Protection Agency “Envirofacts Data Warehouse and Applications”. http://www.epa.gov/enviro/

United States Geological Survey. 1992. National Landcover Dataset, Montana. 30-meter electronic digital landcover dataset interpreted from satellite imagery.

http://nris.state.mt.us/nsdi/nris/nlcd/nlcdvector.html

Various Authors, 2000-2005. Correspondence in DEQ’s PWS files regarding the East End Colony Public Water Supply.

Western Regional Climate Center Montana Climate Summaries. http://www.wrcc.dri.edu/summary/climsmmt.html

9.0 GLOSSARY

Acute Health Effect. A negative health effect in which symptoms develop rapidly.

Alkalinity. The capability of water to neutralize acids.

Aquifer. A water-bearing layer of rock or sediment that will yield water in usable quantity to a well or spring.

Barrier. A physical feature or management plan that reduces the likelihood of contamination of a water source from a potential contaminant source

Best Management Practices (BMPs). Methods for various activities that have been determined to be the most effective, practical means of preventing or reducing non-point source pollution.

Biennial Reporting System (BRS). An EPA database that contains information on hazardous waste sites. The data can be accessed through the EPA Envirofacts website.

Chronic Health Effect. A negative health effect in which symptoms develop over an extended period of time.

Class V Injection Well. Any pit or conduit into the subsurface for disposal of waste waters, including drywells, storm drains and floor drains. The receiving unit for an injection well typically represents the aquifer, or water-bearing interval.

Coliform Bacteria. A general type of bacteria found in the intestinal tracts of animals and humans, and also in soils, vegetation and water. Their presence in water is used as an indicator of pollution and possible contamination by pathogens.

Comprehensive Environmental Cleanup and Responsibility Act (CECRA). Passed in 1989 by the Montana State Legislature, CECRA provides the mechanism and responsibility to clean up hazardous waste sites in Montana.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Enacted in 1980. CERCLA provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. Through the Act, EPA was given power to seek out those parties responsible for any release and assure their cooperation in the cleanup.

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). A database that provides information about specific sites through the EPA Envirofacts website.

Confined Animal Feeding Operation (CAFO). Any agricultural operation that feeds animals within specific areas, not on rangeland. Certain CAFOs require permits for operation.

Confined Aquifer. A fully saturated aquifer overlain by a confining unit such as a clay layer. The static water level in a well in a confined aquifer is at an elevation that is equal to or higher than the base of the overlying confining unit.

Confining Unit. A geologic formation present above a confined aquifer that inhibits the flow of water and maintains the pressure of the groundwater in the aquifer. The physical properties of a confining unit may range from a five-foot thick clay layer to shale that is hundreds of feet thick.

Delineation. The process of determining and mapping source water protection areas.

Glacial. Of or relating to the presence and activities of ice or glaciers. Also, pertaining to distinctive features and materials produced by or derived from glaciers.

Geographic Information Systems (GIS). A computerized database management and mapping system that allows for analysis and presentation of geographic data.

Hardness. Characteristic of water caused by presence of various calcium and magnesium salts. Hard water may interfere with some industrial processes and prevent soap from lathering. Hardness is often expressed in units of milligrams per liter (mg/L) or parts per million (ppm) of $CaCO_3$ (calcium carbonate). Waters with a total hardness in

the range of 0 to 60 mg/L are termed soft; from 60 to 120 mg/L moderately hard; from 120 to 180 mg/L hard; and above 180 mg/L very hard.

Hazard. A relative measure of the potential of a contaminant from a facility or associated with a land use to reach the water source for a public water supply. The location, quantity and toxiTown of significant potential contaminant sources determine hazard.

Hydraulic Conductivity. A constant number or coefficient of proportionality that describes the rate water can move through an aquifer material.

Hydrology. The study of water and how it flows in the ground and on the surface.

Hydrogeology. The study of geologic formations and how they effect groundwater flow systems.

Inventory Region. A source water management area for groundwater systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified three year groundwater travel time.

Lacustrine. Pertaining to, produced by, or formed in a lake or lakes.

Large CapaTown Septic System. Defined by Underground Injection Control regulations as an on-site septic system serving 20 or more persons.

Leaking Underground Storage Tank (LUST). A release from a UST and/or associated piping into the subsurface.

Maximum Contaminant Level (MCL). Maximum concentration of a substance in water that is permitted to be delivered to the users of a public water supply. Set by EPA under authority of the Safe Drinking Water Act to establish concentrations of contaminants in drinking water that are protective of human health.

Montana Bureau of Mines and Geology – Groundwater Information Center (MBMG/GWIC). The database of information on all wells drilled in Montana, including stratigraphic data and well construction data, when available.

Montana Pollutant Discharge Elimination System (MPDES). A permitting system that utilizes a database to track entities that discharge wastewater of any type into waters of the State of Montana.

National Pollutant Discharge Elimination System (NPDES). A national permitting system that utilizes a database to track entities that discharge wastewater into waters of the United States.

Nitrate. An important plant nutrient and type of inorganic fertilizer that can be a potential contaminant in water at high concentrations. In water the major sources of nitrates are wastewater treatment effluent, septic tanks, feed lots and fertilizers.

Nonpoint Source Pollution. Pollution sources that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet. Examples of nonpoint- source pollution include agriculture, forestry, and run-off from Town streets. Nonpoint sources of pollution, such as the use of herbicides, can concentrate low levels of these chemicals into surface and/or groundwaters at increased levels that may exceed MCLs.

Pathogens. A microorganism typically found in the intestinal tracts of mammals, capable of producing disease.

Phase II (and IIb) Rules. EPA updated or created legal limits on 38 contaminants. The rules became effective July 30, 1992 and January 1, 1993. Some of these contaminants are frequently-applied agricultural chemicals such as nitrate and others are industrial solvents.

Phase V Rule. EPA set standards for 23 contaminants in addition to those addressed by the Phase II Rules. The Phase V Rule became effective January 17, 1994. Some of these contaminants include inorganic chemicals such as cyanide and other Phase V contaminants are pesticides that enter water supplies through run-off from fields where farmers have applied them or by leaching through the soil into groundwater. Six are probable cancer-causing agents. Others can cause liver and kidney damage, or problems of the nervous system and brain.

Point Source. A stationary location or a fixed facility from which pollutants are discharged. This includes any single identifiable source of pollution, including but not limited to any pipe, ditch, channel, tunnel, conduit, well,

discrete fracture, container, rolling stock (tanker truck), or vessel or other floating craft, from which pollutants are or may be discharged.

Pollutant. Generally, any substance introduced into the environment that adversely affects the usefulness of a resource (e.g. groundwater used for drinking water).

Permit Compliance System (PCS). An EPA database that provides information on the status of required permits for specific activities for specific facilities. The data can be accessed through the EPA Envirofacts website.

Public Water System (PWS). A system that provides water for human consumption through at least 15 service connections or regularly serves 25 individuals.

Pumping Water Level. Water level elevation in a well when the pump is operating.

Recharge Region. An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers. As a source water management region, the term generally describes the entire area that could contribute water to an aquifer used by a public water supply. Includes areas that could contribute water over long time periods or under different water usage patterns.

Resource Conservation and Recovery Act (RCRA). Enacted by Congress in 1976 to regulate hazardous materials 'from the cradle to the grave.' RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

Resource Conservation and Recovery Information System (RCRIS). A database that provides information about specific RCRA sites through the EPA Envirofacts website.

Secondary Maximum Contaminant Levels (SMCL). The maximum concentration of a substance in water that is recommended to be delivered to users of a public water supply based on aesthetic qualities. SMCLs are non-enforceable guidelines for public water supplies, set by EPA under authority of the Safe Drinking Water Act. Compounds with SMCLs may occur naturally in certain areas, limiting the ability of the public water supply to treat for them.

Section Seven Tracking System (SSTS). SSTS is an automated system EPA uses to track pesticide producing establishments and the amount of pesticides they produce.

Semi-volatile Organic Compounds (SVOCs) Organic compounds that evaporate less readily, commonly found in heavier petroleum products such as diesel fuels and other oils.

Sensitivity. The relative ease with which contaminants can migrate to source water through the natural materials

Source Water. Any surface water, spring, or groundwater source that provides water to a public water supply.

Source Water Delineation and Assessment Report (SWDAR). A report for a public water supply that delineates source water protection areas, provides an inventory of potential contaminant sources within the delineated areas, and evaluates the relative susceptibility of the source water to contamination from the potential contaminant sources under "worst-case" conditions.

Source Water Protection Areas. For surface water sources, the land and surface drainage network that contributes water to a stream or reservoir used by a public water supply. For groundwater sources, the area within a fixed radius or three-year travel time from a well, and the land area where the aquifer is recharged.

Spill Response Region. A source water management area for surface water systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified four-hour water travel time in a stream or river.

Standard Industrial Classification (SIC) Code. A method of grouping industries with similar products or services and assigning codes to these groups.

Static Water Level (SWL). Water level elevation in a well when the pump is not operating.

Susceptibility (of a PWS). The relative potential for a PWS to draw water contaminated at concentrations that would pose concern. Susceptibility is evaluated at the point immediately preceding treatment or, if no treatment is provided, at the entry point to the distribution system.

Syncline. A geologic structure consisting of a down-arched fold with an axial plan dividing it in half.

Synthetic Organic Compounds (SOC). Man-made organic chemical compounds (e.g. herbicides and pesticides).

Total Dissolved Solids (TDS). The dissolved solids collected after a sample of a known volume of water is passed through a very fine mesh filter.

Total Maximum Daily Load (TMDL). The total pollutant load to a surface water body from point, nonpoint, and natural sources. The TMDL program was established by section 303(d) of the Clean Water Act to help states implement water quality standards.

Toxicity. The quality or degree of being poisonous or harmful to plants, animals, or humans.

Toxicity Characteristic Leachate Procedure (TCLP). A test designed to determine whether a waste is hazardous or requires treatment to become less hazardous.

Toxic Release Inventory System (TRIS). An EPA database that compiles information about permitted industrial releases of chemicals to air and water. Information about specific sites can be obtained through the EPA Envirofacts website.

Transmissivity. The ability of an aquifer to transmit water. The transmissivity is determined by multiplying the hydraulic conductivity by the aquifer thickness.

Turbidity. The cloudy appearance of water caused by the presence of suspended matter. Turbidity is measured in nephlometric turbidity units (NTUs).

Unconfined Aquifer. An aquifer containing water that is not under pressure. The water table is the top surface of an unconfined aquifer.

Underground Storage Tanks (UST). A tank located at least partially underground and designed to hold gasoline or other petroleum products or chemicals, and the associated plumbing system.

Volatile Organic Compounds (VOC). Chemicals such as petroleum hydrocarbons and solvents or other organic chemicals that evaporate readily to the atmosphere.

Watershed. The region drained by, or contributing water to, a stream, lake, or other water body of water.

FIGURES

APPENDIX A

PWS SANITARY SURVEY

APPENDIX B

WATER QUALITY ANALYTICAL REPORTS

APPENDIX C

SOURCE WATER MONITORING WAIVERS

MONITORING WAIVERS

Waiver Recommendation

The PWS was grandfathered under the radionuclide rule and is only required to sample once every nine years for these parameters (gross alpha and radium 226/228 combined). The East End Colony PWS has a waiver for Phase II inorganics (barium, cadmium, chromium, fluoride, mercury and selenium). Under this waiver, the PWS collects samples for these parameters every nine years, rather than every three years. The PWS may be eligible for a Phase V inorganics (antimony, thallium, beryllium and nickel) waiver, which would also reduce the sampling frequency to a nine-year cycle. Additionally, in light of the remote and isolated setting of Well 2, the PWS may be eligible for VOC monitoring waivers.

Before a susceptibility or use wavier is requested, the PWS Operators are encouraged to carefully review the Monitoring Waiver Requirements, described below. If after reviewing this section it is determined that an additional waivers are feasible, the PWS should submit a letter to DEQ requesting the specific monitoring waivers. The PWS must be in compliance with monitoring requirements to be considered. If requested by DEQ, the PWS may also need to provide additional information regarding chemical use in the area within the Inventory Region. This is particularly relevant considering the agricultural land surrounding the supply well.

Monitoring Waiver Requirements

The 1986 Amendments to the Safe Drinking Water Act require that community and non-community PWSs sample drinking water sources for the presence of volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs). The US EPA has authorized states to issue monitoring waivers for organic chemicals to systems that have completed an approved waiver application and review process. All PWSs in the State of Montana are eligible for consideration of monitoring waivers for several organic chemicals. The chemicals diquat, endothall, glyphosate, dioxins, ethylene dibromide (EDB), dibromochloropropane (DBCP), and polychlorinated biphenyls (PCBs) are excluded from monitoring requirements by statewide waivers.

Use Waivers

A Use Waiver can be allowed if through a vulnerability assessment, it is determined that specific organic chemicals were not used, manufactured, or stored in the area of a water source (or source area). If certain organic chemicals have been used, or if the use is unknown, the system would be determined to be vulnerable to organic chemical contamination and ineligible for a Use Waiver for those particular contaminants.

Susceptibility Waivers

If a Use Waiver is not granted, a system may still be eligible for a Susceptibility Waiver, if through a vulnerability assessment it is demonstrated that the water source would not be susceptible to contamination. The purpose of the vulnerability assessment procedures outlined in this section is to determine which of the organic chemical contaminants are in the area of investigation. The vulnerability assessment of a surface water source must consider the watershed area above the source. PWSs developed in unconfined aquifers should use a minimum fixed radius of one mile as an area of investigation for the use of organic chemicals. Shallow groundwater sources under the direct influence of surface water (GWUDISW) should assess the watershed area above the source, or a minimum fixed radius of one and one-half miles upgradient.

Given the wide range of landforms, land uses, and the diversity of groundwater and surface water sources across the state, additional information is often required during the review of a waiver application. Additional information may include well logs, pump test data, water quality monitoring data from surrounding public water systems, delineation of zones of influence and contribution to a well; time-of-travel or attenuation studies; vulnerability mapping; and the use of computerized groundwater flow and transport models. DEQ's PWS Section and DEQ's Source Water Protection Program will conduct review of an organic chemical monitoring waiver application. Other state agencies may be asked for assistance.

Susceptibility Waiver for Unconfined Aquifers

Unconfined aquifers are the most common source of usable groundwater. Unconfined aquifers are not contained within impervious geologic strata. As a result, the upper groundwater surface, or water table, in an unconfined aquifer is not under the pressure that produces hydrostatic head common to confined aquifers.

Unconfined aquifers are usually locally recharged from surface water or precipitation. In general, groundwater flow gradients in unconfined aquifers reflect surface topography, and the residence time of water in the aquifer is generally shorter than for water in confined aquifers. Similar water chemistry often exists between unconfined groundwater and area surface water, and physical parameters and dissolved constituents can be an indicator of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater.

Properly assessing a susceptibility waiver application for an unconfined source aquifer requires: site-specific information pertaining to the location and construction of the source development, monitoring history of the source, geologic characteristics of the unsaturated soil zones, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The zone of contribution of the unconfined groundwater source must be defined and plotted. This should describe the groundwater flow directions, gradients, and a 3-year time-of-travel. All surface water bodies within 1,000 feet of the PWS wells must be plotted. Analytical monitoring history of the PWS well and those nearby should be provided as well.

APPENDIX D

CONCURRENCE LETTER